



Learning From Our Experiences - Dealing with High Demand

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Background

- Academic Services - converged service
 - eServices Integration Group
 - Corporate Systems
- Digital University Project
 - build on existing experience
 - portal framework = uPortal
 - Content Management
 - port.hull launched September 2003



port.hull details

- 18,000 potential users
 - all faculty, staff and students
- Locked layout
 - familiarization for users and support staff
 - critical mass of content required
- Load tests prior to launch
 - up to c. 500 logins/minute



port.hull content

- Central databases
 - Legacy applications – CWebProxy
- News
 - RSS channel
- Custom channels
 - Library systems
 - Internal web content
 - Webmail



The killer app...

- DUP aim to consider processes
 - key process in the academic year
 - Academic Office approval
- User needs survey (2003)
 - Review Your Grades
 - “top 5 for all categories of students (FE students 1st, undergraduates 2nd and post-graduates 5th)”
 - add value with archive of previous grades
 - <http://www.fair-portal.hull.ac.uk/downloads/stakereq.pdf>



Publication of grades

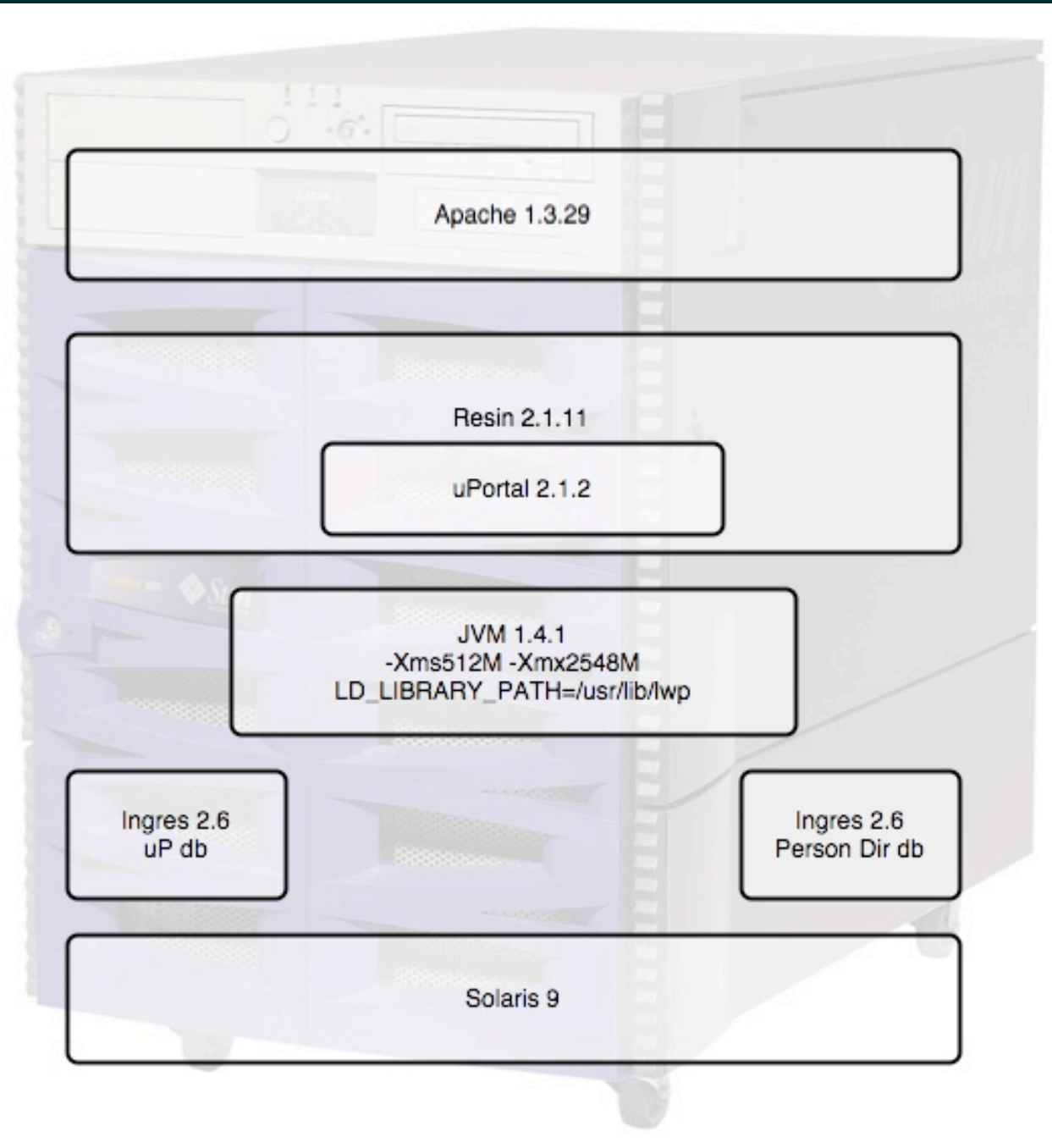
- Previously
 - labour intensive, paper-based
- Change the process
 - grades available only via the portal
 - publicity campaign
- Big Bang
 - no process fallback
 - no technical alternative route
- 2 February 2004





- Sun v880
- 2 x SPARC 750MHz
- 4Gb RAM



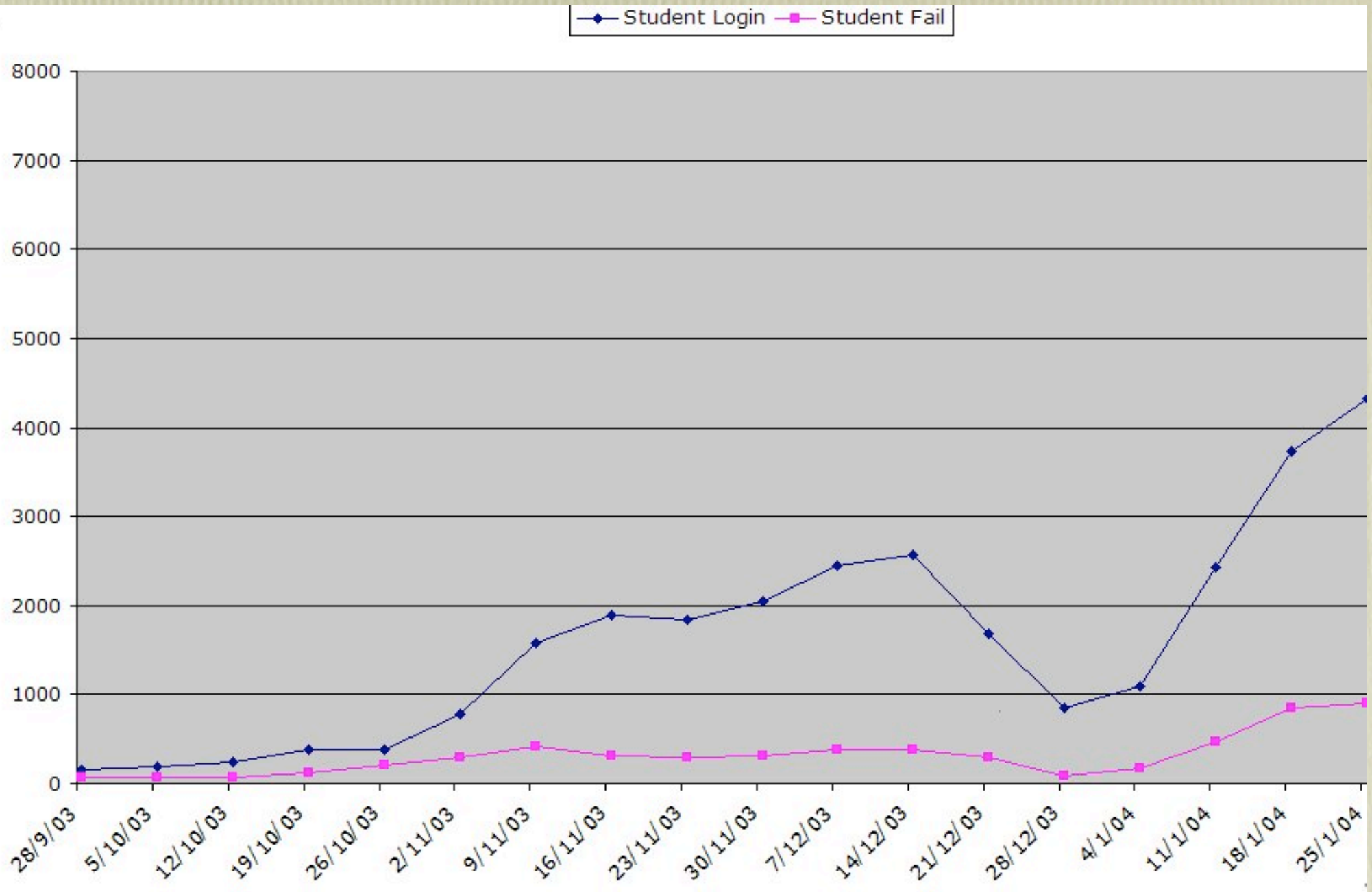


Portal database

- Ingres - optimized schema
 - additional index for UP_USER on user_name
 - Query Execution Plan:
 - no index = Disk cost 240 i/o; CPU cost 84 ms
 - index = Disk cost 5 i/o; CPU cost 0 ms
- table for PersonDir data
 - extended schema



e-SERVICE INTEGRATION



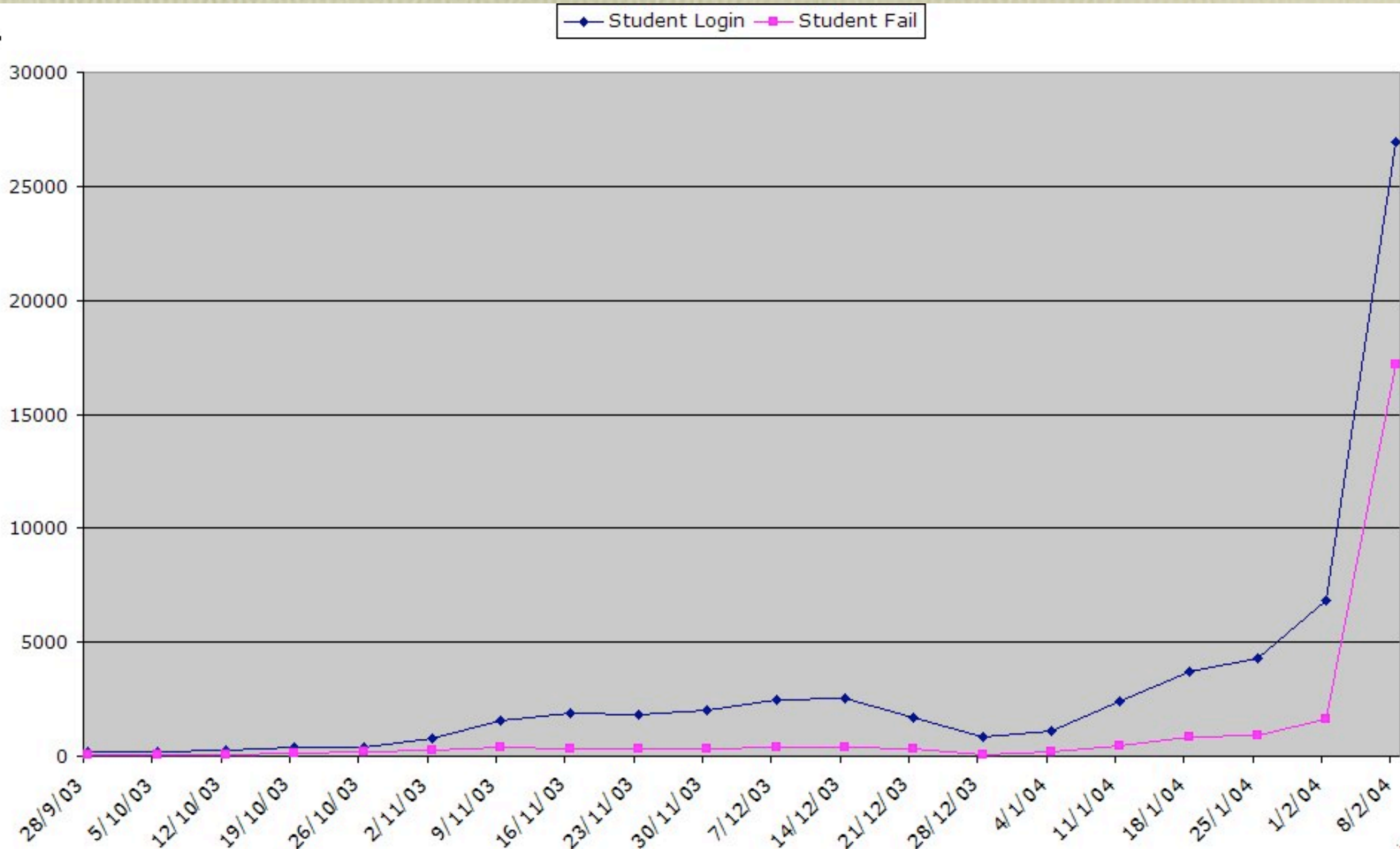
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What happened next?

- The portal stopped working
- 10,000 undergraduates wanted grades at the same time
- Intense demand
 - uPortal log shows 90 unique login/s at peak
 - load also generated by repeated logins



e-SERVICE INTEGRATION



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What was happening?

- Apache failure
 - default configuration
- Application server stable
- Database locking
 - session locking out of control
- You are not authorized to view this channel
- Helpdesk under pressure
- **Some** users seeing grades



Actions in the first 2 days

- Stabilise the system
- Apache config
 - Amended apache source files and runtime config files
 - Httpd.h - `#define HARD_SERVER_LIMIT 2048`
 - Httpd.conf - `MaxClients 2048`
- JDBC config
 - increase max number of connections
 - low client timeout



Actions in first week

- Code analysis
 - Locking strategies unsuitable for Ingres?
 - Database update row first to take exclusive lock (seq_no + 1)
 - Programmatic operation to account for previous update (seq_no - 1)
 - Commit, release lock
- Database analysis
 - Checked table indexes present
 - Applied statistics, Optimized database



After the first week

- High level of access caused Apache failure
 - implemented increased maxClients
- Db locking caused by activity at login
 - number of tables and indexes maintained by DBMS
 - compounded by number of new users
- Solution
 - using locked layout, so preload the uPortal data
 - modify the code to remove writes to the uPortal db



Preloading the database

- Create batch process to populate required uPortal tables from University dbs and uPortal db
- Tables updated:
 - UP_USER, UP_USER_LAYOUT, UP_USER_PARAM, UP_USER_PROFILE, UP_USER_UA_MAP, UP_SS_USER_PARM, UP_SS_USER_ATTS, UP_GROUP_MEMBERSHIP
 - 450,000 rows
- Written in Ingres/Abf using Ingres Star to connect to multiple databases



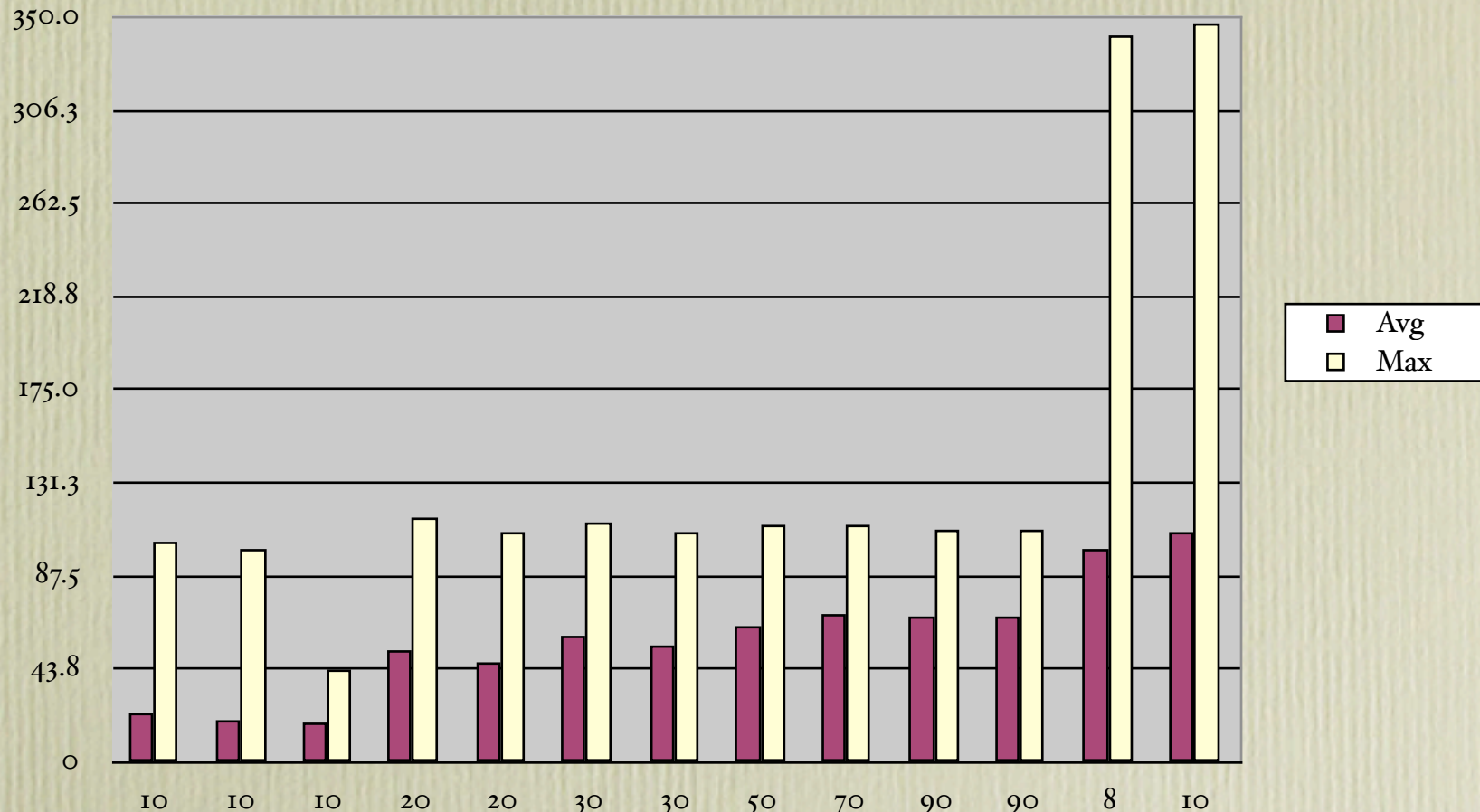
What happens at login?

- The first time
 - c. 35 SELECTs and 25 writes to db
- subsequently
 - c. 25 SELECTs and 18 writes to db
 - writes to db occur in `RDBMUserLayoutStore.getUserLayout`
 - deletes all rows for user in `UP_SS_USER_ATTTS` and repopulates
- to remove writes amend `RDBMULS`
 - `UP_SS_USER_ATTTS` already correct in preload



Further load testing

- use Httpperf to generate login activity only



robust but slow



Other steps

- Check with other schools
- Hardware upgrade
 - blades for load balancing and SSL processing
 - existing server to run database only
- But pre-loaded data needs
 - amending when layouts are not locked
 - amending for future changes to uPortal schema
- So pre-loaded probably only for the next year



After the event

- Semester 2 - different process
 - staggered release
 - process backup
 - c. 2000 student logins
- Positive experience
 - everyone happy to get grades via port.hull
 - early in the service history



Future

- Accurate demand prediction
- Avoid big bang or ensure suitable fallback
- Meta portal: associated e-services
- Db load balancing
- uPortal 3 - changes to login process?
- Choice of db
 - Ingres open-source by August
- WSRP
 - spread the load
 - integrate meaningful external content



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